

Mechanical Drafting

Levels: Grades 11-01
Units of Credit: 1.0
CIP Code: 15.1304
Prerequisite: Design & Drafting Technology

COURSE DESCRIPTION

Advanced Drafting is the third step in understanding the application required to produce a workable drawing. Good sketching techniques should be emphasized when preparing to start a working drawing. Drawings that are assigned should complement the competency and require the student to solve problems, not just copy.

STANDARD 151304-01 **The student will be able to develop a technical drawing using standard sectional views such as full, half, offset, broken-out, removed, and revolved.**

OBJECTIVES

151304-0101 The drawing accurately demonstrates previous competency standards.
151304-0102 Section drawings are completed according to ANSI standards.
151304-0103 Section lines are drawn at a 45-degree angle unless a more appropriate angle is justified.
151304-0104 Section lines are dark and very thin.
151304-0105 Cutting plane lines are drawn according to the alphabet of lines.
151304-0106 Break lines are drawn according to the alphabet of lines.
151304-0107 Section lines are spaced uniformly.
151304-0108 Visible edges and contours behind the cutting plane are correctly shown.
151304-0109 Hidden lines are omitted.
related academic: (m6, m8.9)

STANDARD 151304-02 **The student will be able to demonstrate the use of auxiliary views.**

OBJECTIVES

151304-0201 Create a primary auxiliary view from any orthographic projection.
151304-0202 Draw folding lines or reference-plane lines between any two adjacent views.
151304-0203 Construct depth, height, or width auxiliary views.
151304-0204 Plot circles and arcs are drawn to conform to the intersection of projection lines and transferred lines.
151304-0205 Construct partial auxiliary views.
151304-0206 Create auxiliary sectional views.
151304-0207 Find the true length of an oblique line by constructing an auxiliary view.
151304-0208 Find the true size of an oblique plane by constructing auxiliary views.
151304-0209 Create secondary auxiliary views.
related academic: (m1, m4, m4.4, m6, m8, m8.9)

STANDARD **The student will be able to demonstrate the use of intersections and**
151304-03 **developments.**

OBJECTIVES

151304-0301 Parallel lines.
▪ Flat surface pattern development (boxes).
▪ Flat surfaced pattern pipe.
▪ Pipe patterns with an angle of turn (end cuts).
▪ Flat surface pattern prism.
▪ Intersections of prisms.
▪ Intersections of pipes.

151304-0302 Radial.
▪ True length.
▪ Right pyramid development.
▪ Conical surface development (cone).
▪ Truncated cone development.

151304-0303 Triangulation.
▪ True length.
▪ Square to round.
▪ Rectangular to round.
▪ Round to round different diameters.
▪ Circular pipes oblique joints.
▪ Intersections of prisms and cylinders.
▪ Oblique cone development.

STANDARD **The student will be able to understand and demonstrate the use of**
151304-04 **fasteners.**

OBJECTIVES

151304-0401 Define thread terminology.

151304-0402 Develop different thread forms.

151304-0403 Calculate thread pitch.

151304-0404 Write different thread notes.

151304-0405 Draw the simplified, schematic, internal and external type threads.

151304-0406 Work with American National, Unified and metric threads.

151304-0407 Identify thread difference between national pipe threads and American National Thread Series.

151304-0408 Specify different types of cap and machine screw heads, fasteners standard lengths.

151304-0409 Specify different types of keys e.g. Woodruff, Pratt & Whitney, gib head, square, and flat.

151304-0410 Specify different types of lock nuts and locking devices.

151304-0411 Draw blind, through, and clearance holes, studs, cap machine screws, pins and specialty fasteners.

151304-0401 Specify setscrew heads and points.

151304-0413 Specify miscellaneous bolts and screw.

151304-0414 Identify taper, plug, and bottoming taps with standard tap drill hole sizes.

151304-0415 Identify standard bolt sizes, lengths, different types of heads and finishes.

151304-0416 Correctly draw, locate, and label fasteners on production, assembly drawings, and parts lists.

**STANDARD
151304-05**

The student will be able to understand and demonstrate the use of pictorial drawings.

OBJECTIVES

- 151304-0501 List three types of axonometric drawings.
- 151304-0502 Identify positions used as axis lines for isometric drawings.
- All axes are constructed at 30 degrees off the vertical (10 degrees off the horizontal).
- 151304-0503 Identify plane surfaces on isometric boxes.
- Holes, cylinders, prisms, and other features are in proper alignment and in their proper relationship to each other.
 - Hidden lines are omitted.
 - Shading and dimensions (when required) are shown according to the text and instructions given.
- 151304-0504 Construct angles on an isometric.
- Angles and other non-isometric lines are constructed according to the instructions in the text
- 151304-0505 Construct isometric circles and arcs.
- 151304-0506 Construct and isometric in the center of a drawing space.
- 151304-0507 List three types of oblique drawings.
- 151304-0508 Construct an oblique drawing in the center of a drawing space.
- All axes are shown at the designated angles and positions.
 - The drawing is to the appropriate size and scale.
 - Circles are constructed as ellipses in the oblique planes.
 - Parallel lines are drawn as required in text instructions.
- 151304-0509 Construct angle on an oblique drawing.
- Angles and other non-isometric lines are constructed according to the instructions in the text.
 - Holes, cylinders, prisms, and other features are in proper alignment and in their proper relationship to each other.
 - Hidden lines are omitted.
 - Shading and dimensions (when required) are shown according to the text and instructions given.
- 151304-0510 Construct oblique circles.
- 151304-0511 Construct a cavalier oblique drawing of a given object.
- 151304-0512 Construct a cabinet oblique drawing of a given object.
- 151304-0513 List three types of perspectives.
- 151304-0514 Identify the views of perspectives.
- 151304-0515 Identify lines and points in a two-point perspective.
- Identify and use designated angles and positions for all axes, horizons, site points, vanishing points, ground lines, picture planes, and other construction lines.
- 151304-0516 Construct a drawing to the appropriate size and scale.
- 151304-0517 Construct a one-point perspective.
- Circles are constructed as ellipses.
 - Parallel lines are drawn as required in text instructions.
 - Angles and inclined lines are constructed according to the instructions in the text.

- Holes, cylinders, prisms, and other features are in proper alignment and in their proper relationship to each other.
- Hidden lines are omitted.
- Shading and dimensions (when required) are shown according to the text and instructions given.

151304-0518

Construct a two-point perspective.

- Circles are constructed as ellipses.
- Parallel lines are drawn as required in text instructions.
- Angles and inclined lines are constructed according to the instructions in the text.
- Holes, cylinders, prisms, and other features are in proper alignment and in their proper relationship to each other.
- Hidden lines are omitted.
- Shading and dimensions (when required) are shown according to the text and instructions given.

related academic: (m1, m6, m8.9)

**STANDARD
151304-06**

The student will be able to understand and demonstrate the basics of Geometric Dimensioning and Tolerancing (GD&T).

OBJECTIVES

151304-0601

Basic tolerancing terminology.

151304-0602

GD&T terms and symbols.

151304-0603

Create limit dimensions.

151304-0604

Describe the nominal size, tolerance, limits, and allowances of two mating parts.

151304-0605

Identify a clearance fit, interference fit, and transition fits.

151304-0606

Describe the basic hole and basic shaft systems.

151304-0607

Dimension two mating parts using limit dimension, unilateral tolerances, and bilateral tolerances.

151304-0608

Specify the classes of fits as required on exercises and drawings.

151304-0609

Draw geometric tolerancing symbols.

151304-0610

Specify position and geometric tolerances.

151304-0611

Draw and place feature control symbols and datum references on a drawing.

- Specify form tolerances e.g. Straightness, flatness, roundness (circularity), cylindricity, profile, angularity, parallelism, perpendicularity, and concentricity.

151304-0612

Specify positional tolerances in reference to maximum material condition (MMC), regardless of feature size (RFS), and least material condition (LMC).

151304-0613

Specify and apply the tolerance symbols, tolerances and Datums on various drawings.

**STANDARD
151304-07**

The student will be able to understand and identify basic welding symbols.

OBJECTIVES

151304-0701

Understand, identify and draw basic weld symbols.

151304-0702

Understand and create detail drawings for welded part.

151304-0703

Understand and specify weld types on drawings.

151304-0704	Understand and specify weld size on a drawing.
151304-0705	Understand and specify finish and contour of welds.
151304-0706	Understand and indicate field welds on a drawing.
151304-0707	Understand and indicate welding process on a drawing.
151304-0708	Understand basic welding processes.

STANDARD **The student will be able to understand and demonstrate applied**
151304-08 **mathematics.**

OBJECTIVES

- 151304-0801 Perform basic arithmetic functions.
- Add, subtract, multiply, and divide whole numbers.
 - Add, subtract, multiply, and divide fractions.
 - Add, subtract, multiply, and divide decimals.
- 151304-0802 Convert fractions/decimals.
- Convert fractions to decimal equivalents.
 - Convert decimal values to nearest fractional equivalent.
 - Use decimal equivalent chart for conversions.
- 151304-0803 Convert metric/inch measurements.
- Convert inch dimensions to metric.
 - Convert metric dimensions to inch.
 - Use metric/inch conversion chart.
- 151304-0804 Perform basic trigonometric functions
- Solve for unknown angles.
 - Solve for unknown sides.
 - Calculate bolt hole patterns.

STANDARD **The student will be able to understand and assemble working drawings.**
151304-09

OBJECTIVES

- 151304-0901 Develop a set of working drawings of six or more parts, of industry assembled parts.
- Draw all necessary views of each part.
 - Draw only one part per sheet.
 - Dimension parts as per ANSI Y 14.5 standards.
 - Apply appropriate tolerances.
 - Apply necessary notes, material specifications, symbols, and other data.
 - Complete a parts list of the parts, which include, parts number, manufacturer's name, manufacturer's stock number, material specs, quantity of each part, and notes for assembly.
 - Complete an assembly drawing showing the relationship the parts to each other.
 - Include title block and border on each production drawing sheet.

STANDARD **The student will be able to understand and identify manufacturing**
151304-10 **processes.**

OBJECTIVES

151304-1001	List the manufacturing processes typically used today.
151304-1002	Describe the casting and foundry processes.
151304-1003	Describe the basic process of pattern making.
151304-1004	Identify operations that can be performed with an engine lathe, drill press, mill, shaper, grinder, punch press, EDM, and broach.
151304-1005	Identify various types of machined holes.
151304-1006	Identify common material stock forms.
151304-1007	Describe the purpose of tooling, jigs, and fixtures.
151304-1008	List the common plastic processing and forming techniques.
151304-1009	Understand the difference between good and poor design.
151304-1010	Describe the roll Quality Control (QC) plays in manufacturing.